4/11/2015

محاضرة [9] نظرية ماكينات

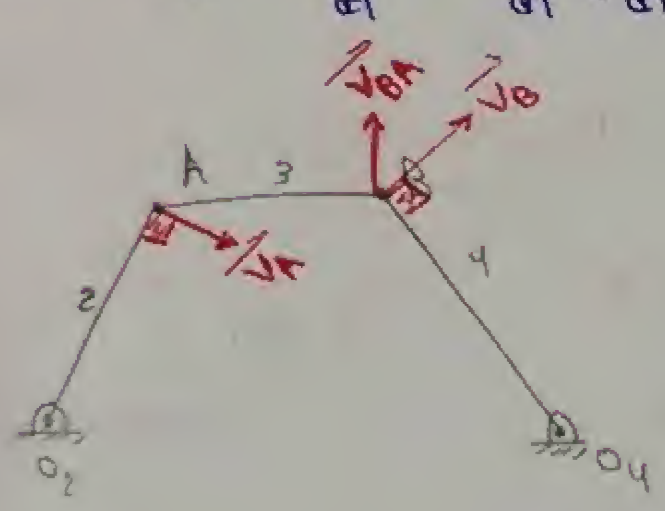
AMR

[9]

Acceleration Analysis

- Velocity : $\overrightarrow{V} = \frac{dx}{dt}$ (m/s)

- Acceleration : $\overrightarrow{A} = \frac{dv}{dt} = \frac{d}{dt}\left(\frac{dx}{dt}\right) = \frac{d^2x}{dt^2}$ → (m/s^2)



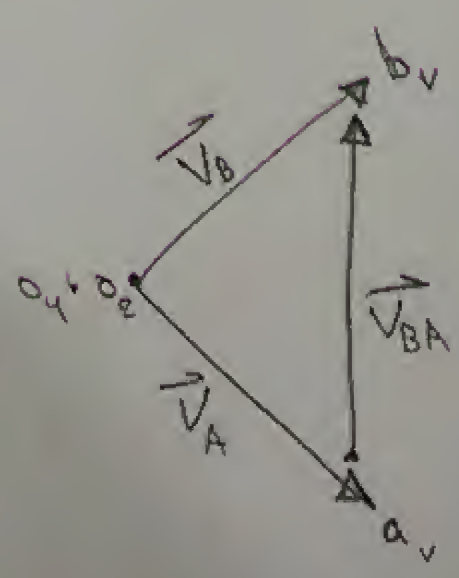
volicity polygon diagram.

$\overrightarrow{V_A} = \overline{O_2A} * w_2 \rightarrow (\perp O_2A)_A \, , \, w_2)$

$\overrightarrow{V_B} = (\perp O_4B)_B \, , \, w_4)$

scale

$\overrightarrow{V_{BA}} \rightarrow (\perp BA)_A)$



$\overrightarrow{V_B} = o_vb_v * \text{scale} =$

$\overrightarrow{V_{BA}} = a_vb_v * \text{scale} =$

$w_4 = \frac{\overrightarrow{V_B}}{O_4B} = \text{---} \ rad/s$

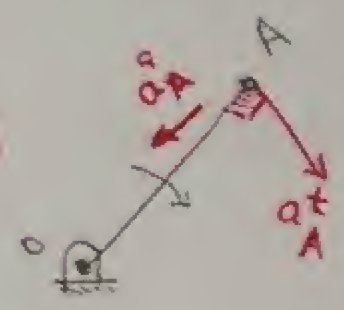
$w_3 = \frac{\overrightarrow{V_{BA}}}{BA} = \text{.....} \ rad/s$

b

$$\overrightarrow{V_B} = \overrightarrow{V_A} + \overrightarrow{V_{BA}}$$

$$\overrightarrow{A_B} = \overrightarrow{A_A} + \overrightarrow{A_{BA}}$$

$\overrightarrow{A_B}$ ↓ $(A_B^n + A_B^t)$ — $\overrightarrow{A_A}$ ↓ $(A_A^n + A_A^t)$ — $\overrightarrow{A_{BA}}$ ↘ $(A_{AB}^n + A_{AB}^t)$



Acceleration

1. Normal Acc. (Radial Acc.) (A^n)

$$\overrightarrow{A^n} = \omega^2 R$$

$$\overrightarrow{A^n} = \left(\frac{V}{R}\right)^2 \cdot R$$

$$\overrightarrow{A^n} = \frac{V^2}{R}$$

2. Tangential Acc. (A^t)

$$A^t = \alpha \cdot R$$

ليس من الضرورة أن يكون باتجاه α هو نفس باتجاه ω ← وذلك في حالة العجلات التناقصية

Δ

$$A_B^n = \omega_4^2 * O_4B = VV \quad rad/s$$

$$A_B^t = \alpha \cdot R$$

$$A_A^n = \omega_2^2 * O_2A = VV$$

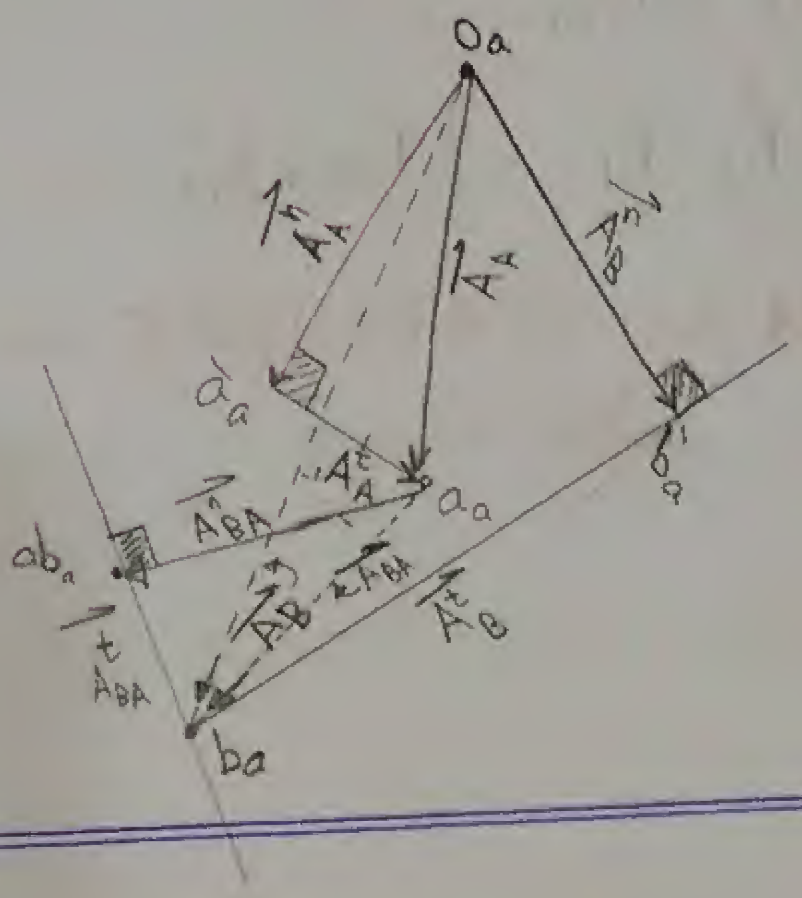
$$A_A^t = \alpha_2 * O_2A = VV \longrightarrow (IF\ \omega_2 = const.\ \&\ \alpha_2 = Zero.)$$

$$A_{BA}^n = \omega_3^2 * BA = VV$$

$$A_{BA}^t = \alpha_3 \cdot BA = VV$$

Acceleration Polygon

(scale ma): 1cm = ... m/s^2



Acceleration analysis

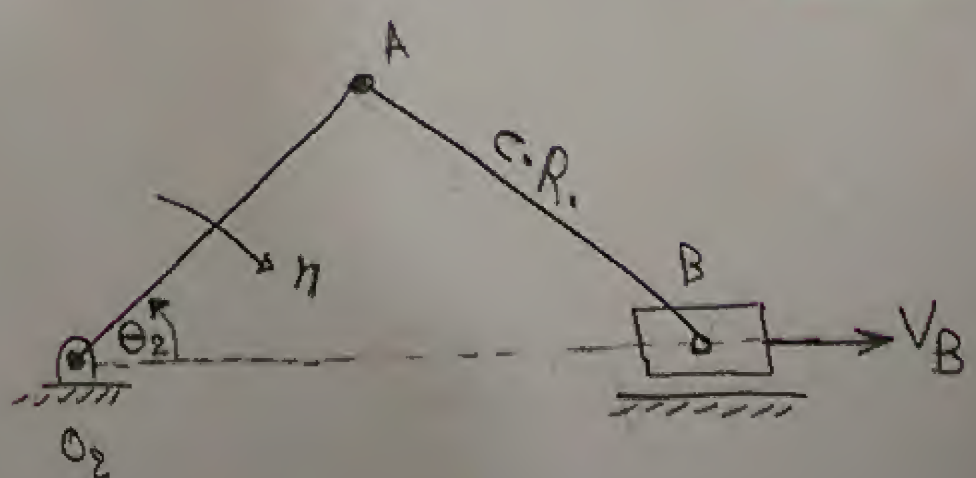
slider crank Mechanism . (S.C.M)

m_L : O_2A

AB

O_2B

θ_2



solution

1) velocity Polygen.

$\vec{V_A} = \omega_2 * O_2A \longrightarrow (\perp O_2A)$

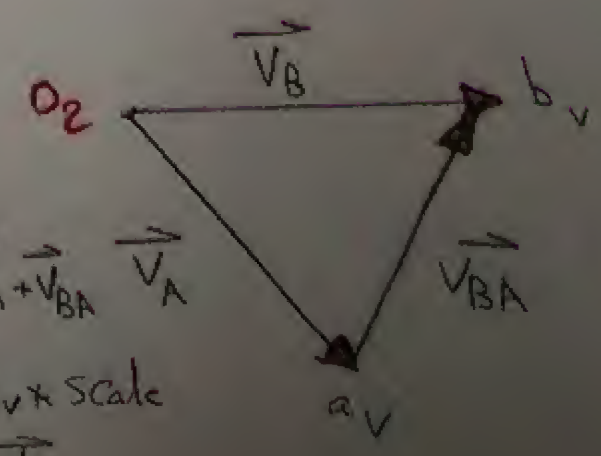
$\vec{V_B} \longrightarrow$ (H. to Right)

$\vec{V_{BA}} \longrightarrow (\perp BA_B)$

$\vec{V_B} = \vec{V_A} + \vec{V_{BA}}$

$\vec{V_B} = O_vb_v \times$ Scale

$\vec{V_{BA}} = \vec{V_B}$



report

e

Prob : Figure below shows the mechanism of a moulding press in Drawing

OA = 80 mm ; BA = 320 mm ; BC = 120 mm BD = 320 mm

The vertical distance of OC is 240 mm and horizental distance of OD is 160 mm- when crank OA rotates at 120 rpm (aniclockwise) determin :-

the acceleration of D and angules acceleration of the link CB.